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Food Security Problems in Marine Resources (Case Study of Marine Debris)

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Abstract: *Research on the issue of food security in marine resources has been conducted, that is about the case study of marine debris. Indonesia is one of the largest maritime countries in the world. Indonesia's area is 7.81 million km². At this time Indonesia is trying to optimize the role of the sea to support national development. The sea and all its resources play a role in supporting food security. Indonesia's challenge in realizing marine sustainability is hampered by marine debris. The escalation of marine debris will continue to increase along with increased urbanization, production, and consumption. This study uses qualitative methods, which examine marine debris in Indonesia and its effects. Every year Indonesia's oceans produce waste of 3.22 million tons. Then, the estimated leakage of marine plastic waste metrics is 0.48-1.29 million tons. Indonesia's marine debris is 41% dominated by plastic waste. Micro plastics endanger the lives of organisms. Plastic waste is very influential in the occurrence of climate change. Starting from the production process, consumption to disposal that produces high carbon emissions. Food security, sustainable marine sustainability, and climate change greatly affect human security. Therefore, Indonesia must optimize the role of the sea to support food security.*

Keywords: Environment, Food Security, Marine Resources, Marine Debris, Plastics

I. INTRODUCTION

Indonesia is one of the largest maritime countries in the world. The area of Indonesia is 7.81 million km2 (Pratama, 2020). The area consists of 3.25 million km2 of ocean and 2.55 million km2 is the Exclusive Economic Zone. The area of that island is 2.01 million km2. The vast sea area, has made Indonesia has very large marine and fishery resources. Data from the directorate general of marine space management (2020) said that the value of Indonesia's exports from fisheries in 2019 reached Rp 73,681,883,000. The increase in export value from 2018 to 2019 is 10.1%.

At this time Indonesia is trying to optimize the role of the sea in supporting national development. The Indonesian government is determined to make Indonesia as the world's maritime fulcrum country. To make this happen, the Government of Indonesia established 5 main pillars. One of them is committed to maintaining and managing marine resources. The focus is to build marine food sovereignty through the development of the fishing industry by placing fishermen as the main pillars.

Indonesia is an archipelago that has an area of 2/3 of land. The development of the marine sector is an opportunity and challenge for Indonesia. The ocean is a complex natural system that is closely related to the activities and ecosystems of land (Oceanpanel.org). Problems involving the sea arise because of the dense importance of the sea from various sectors. As a result, the carrying capacity of the sea is decreasing in the provision of food. The 1994 Human Development Report of The United Nations Development Programme (UNDP) at The United Nations 1995 World Summit on Social Development held in Copenhagen, Denmark in 1995 has sparked the scope of human security. The scope includes food security and environmental safety. Food security and marine sustainability are also included in the goals of the Sustainable Development Goals (SDGs) 2030. Christian Bueger (2015) in his maritime security matrix also added the marine environment as an element in maritime security. The importance of a sustainable sea from various threats has its own dimensions in maritime security.

The sea and all its resources play a role in supporting food security. In fish resources, Bluepaper commissioned a high-level panel for a sustainable ocean economy mentions that fish account for 20% of animal protein sources, this amount is 6.7% of the overall protein consumed by humans worldwide. Its contribution reaches 50 percent in some regions, especially in small island developing countries (FAO 2018). The human need for marine resources such as fish and others will continue to increase along with the increase in the human population. World food needs are expected to reach 500 million metric tons (MMT) by 2050 (FAO 2018, 2009). Seafood has the potential to meet most of these needs.

Costello et al (2019) in their research found that the sea can provide 6 times more food than today. Seafood has an important role in ensuring food security because it is highly nutritious, containing vitamins, minerals, omega 3s, and other nutrients, which cannot be obtained from plants or other animal proteins.

The ocean has a very important role in supporting food security. Therefore, the marine environment must be maintained so as not to be polluted. Marine pollution will cause food coming from the sea to be polluted. Many impacts occur when a country's marine environment is polluted. This article is about the problem of marine debris in Indonesia. Indonesia's challenge in realizing marine sustainability is hampered by marine debris. The escalation of marine debris will continue to increase as urbanization, production, and consumption trends continue to increase. This will be explained more deeply how marine debris can affect human security.

II. METHOD

This study uses a qualitative method, which weighed about marine debris Indonesia and its impact. The research design used in this research is phenomenology and case study. The researchers used data collection techniques qualitative as basic guidelines. The researchers also conducted a descriptive analysis of secondary data such as reference journals, reports, and others.

III. RESULT AND DISCUSSION

The United Nations Development Programme (UNDP) has developed a scope of the concept of human security that is becoming more widespread. Elmennya namely food security and environmental security. UNDP defines food security as "Physical and economic access to basic food" with the threat that "Hungers, Famines, and the lack of physical and economic access to basic food". While the definition of the security environment that is "Healthy physical environment" with his threat is "Environmental degradations, natural disasters, pollutions, and resource depletions" Report (UNDP, 1994).

The sea has the power homeostatic, that is the ability to maintain balance, and is the aquatic ecosystem that has the power to purify yourself from all the distractions that enter into the body of the waters. Coastal waters are the end of the shelter of all types of waste generated by human activity (Dahuri, 2001). Darmono (2001) mentions that the sea received materials that are carried by water from agricultural areas, household waste, waste material, and waste from ships, oil spills, offshore, and other wasted to the sea (Putra and Husrin, 2017). The main source of plastic waste in the ocean comes from human activities such as industrial activities, tourism, fisheries, shipping, and households (LIPI, 2019).

East Asia is the region with the growth of the production of waste is the fastest in the world. Articles that have been published show that among the 192 countries in the world that have been analyzed, the five countries are responsible for more than 50% of the overall plastic waste in the oceans. Everything is in the region of East Asia, namely China, Indonesia, Vietnam, Philippines, and Thailand (Jambeck et al, 2015). The Data shows that Indonesia ranked second after China.

3.1 Indonesian Marine Debris

In 2010, Indonesia has a population of coastal areas of 187,2 million. Of the residential population within 50 km of the coast. Waste that is produced each year by 3,22 million tons. this waste is not managed well and is estimated to result in a leakage of 0.48-1.29 million metric tons of plastic waste per year into the oceans (World Bank, 2018). The main source of plastic waste comes from human activities, such as industrial activity, tourism, fisheries, shipping, and households (Cordova et al, 2018). The Ministry of Marine Affairs and Fisheries provides statistics on the composition of marine debris Indonesia 2017.

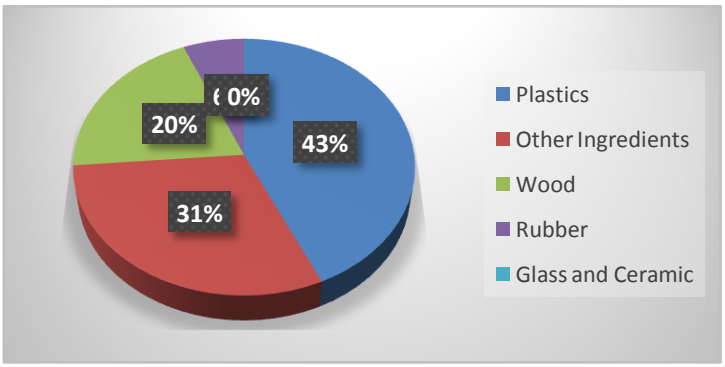

Figure 1 The Composition of Marine Debris Indonesia 2017
(Source: Ministry of Marine affairs and Fisheries of Indonesia, 2017)

Marine debris is dominated by plastic (figure 1). Plastic waste in the sea is one of the pollutions and the waste becomes a global challenge. This is evidenced by the declaration of the resolution of the waste plastic and along in the sea by The United Nations Environment Programme 2017 in Nairobi-Kenya. In line with that, on October 29-30, 2018 at the Our Ocean Conference (OOC), which took place in Nusa Dua, Bali, Indonesia agreed to a cleanup of the sea in the territory of each state (LIPI, 2019). The issue of ocean pollution by plastic waste is currently being discussed globally. Experts are aware of the potential dangers that threaten marine life and humans.

As a state of law, Indonesia has set the handling of waste in the sea in some of the rules. The regulation consists of:

1. Law No. 18 of 2008 on Waste Management
2. Government regulation No. 81 of the Year 2012 on the Management of Household Waste And Similar Rubbish Household Waste
3. Presidential regulation No. 97 of the Year 2017 on National Policy and Strategy of the Management of Household Waste and the Type of Household Waste
4. Presidential regulation No. 35 of the Year 2018 on Accelerating the Development of the Installation of Waste to Energy Power Technology-Based eco-Friendly
5. Presidential regulation No. 83 of the Year 2018 on the Management of Marine Debris.

3.2 Marine Debris and Food Security

According to the world food organization (FAO), food security is a situation that exists when all people, at all times, have physical access, social and economic for food is sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life. The sea can provide forage for man, even so, the food will harm humans if it is polluted by the waste of the sea.

Plastic waste that is dumped into the surroundings will be garbage permanent, on land, or in waters. In fact, the plastic waste in the ground will eventually get to the water through the hydrological. Physical processes in the form of fragmentation of mechanical and photolysis make the plastic waste that was originally sized macro into micro-sized. Garbage plastic micro-sized is called along (Yaqin, 2020).

Stephanie L Wright scientist from the University of Exeter, Uk, estimates that micro-plastics have been contaminating the waters of the ocean the world with the concentration of most of the 100,000 particles/m3 in 2017. In the waters of the Cilacap Syakti et al (2017) find the concentration of micro-plastics by 2.5 mg/ m3. In the Bay of Jakarta particles of micro-plastic in the sediment of 38.790 particles/kg (Manalu et al., 2017). In the sediment habitat of the coral waters of the Lombok found an average of 48.3 particles/kg (Cordova et al., 2018). Yaqin (2021) in his writings mentioned that Rahim et al (2020) found that the concentration of micro-plastics by 50 mg/L in water media already can endanger the life of the green shells. In addition to the waters, micro-plastics are also found in the body of aquatic biota human consumption, as in shellfish (2,1-10,5 particles/g), oysters (0.18–3.84 particles/g) shrimp brown (0.68 particles/g), fish mackerelpasifik (0.33 particles/g), tuna fish (5,9 × 10-4 particles/g), herring (of 0.01 particles/g), anchovy peru (0,057 particles/g).

Micro-plastic harms the life of the organism (directly and indirectly). A direct impact can be either physical disorder such as damage to the gills, stomach, and intestine. Chemically micro-plastic leach harmful substances that it contains. This will disrupt the process of biochemical in the body of aquatic biotas, such as the destruction of the work of the endocrine system. Indirectly micro-plastic that interacts with the contaminants of organic and non-organic others such as metal, PCB (polychlorinated biphenyl's), PAH (polycyclic aromatic hydrocarbons) and, others can reduce growth, reproduction, and the performance of the life of an individual. Damage at the level of individual marine organisms will result in damage to the population, community and, even the ecosystem.

The pollution of the micro-plastic in the ocean waters provides serious leverage to aquatic biota in part being used as a source of food that is important for humans. The presence of microplastics in seafood interferes with the pillars of availability and utilization of food as well as food security. After the micro-plastic ingestion, the organism of the sea can't break down synthetic polymers via enzymatic activity. this means that micro-plastics can be retained in the digestive system and cannot be digested. In such conditions, water animals will not feel hungry and then not do the activity feed. eventually, the animal will experience death due to a lack of nutrients.

Microalgae are the main food for herbivorous fish, micro-plastics can reduce the process of photosynthesis and growth. Plastic waste that nano-size has been studied by Bouwmeester et al., (2015). he finds that it can get into all the organs of the animal body and can damage cells. Therefore, the availability of seafood is one of the pillars of food security sooner or later will be impaired by the presence of microplastics in the ocean. Micro-plastic that absorbs or plastered pollutants, as well as other pathogenic microbes when entered into the body of aquatic organisms, will help increase the accumulation of pollutants in the body. Through that process, water animals are not healthy anymore

consumed by humans because in his body already accumulated micro-plastic and pollutants default. On aquatic invertebrates such as clams, which are all part of the soft tissue for human consumption, the presence of microplastics in its body will be translated to the human body that eats. From here we know that the micro-plastics threatening the pillars of food security. Humans eating food polluted sea along will experience health problems. direct human comes to consume along from the food of the sea.

3.3 Marine Debris and Environmental

The environmental aspects referred to in this article are about climate. Researchers found that there is a link between marine debris and climate change. The correlation between marine debris and climate change is found in the composition of plastic waste that dominates. Plastic waste is very influential in the occurrence of climate change. The process of production, consumption the disposal of plastic waste produces high carbon emissions (Utami, 2019). Carbon emissions are a major factor in climate change. On the declaration Because the Ocean in the Ocean Action Day held in Bonn, Germany has been discussed about climate change conference. This declaration is intended to strengthen the global response to the impact of climate change on the ocean. This is because 70% of the earth's surface is an ocean, and absorbent carbon emissions are the largest on earth in the ocean.

Climate change resulted in various negative impacts, namely damage to marine ecosystems, food security, natural disaster, etc. Indonesia is ranked 9th out of the 10 countries most vulnerable to food security threats due to the impact of climate change on the fisheries sector (Huelsenbeck, 2012). Due to the impact of climate change and ocean acidification, which is related to the availability of seafood. Indonesia was ranked 23rd out of the 50 most vulnerable countries based on the same study. Previous articles managed to find the presence of the implications of the case of overfishing on food security. The article gives the conclusion that the actions of overfishing in addition to reducing the fish population also resulted in environmental damage (Carmelite, 2019).

3.4 Marine Debris, Food Security, and the Environment

The link between marine debris, marine environmental sustainability, and food security to human safety can be seen in figure 2.

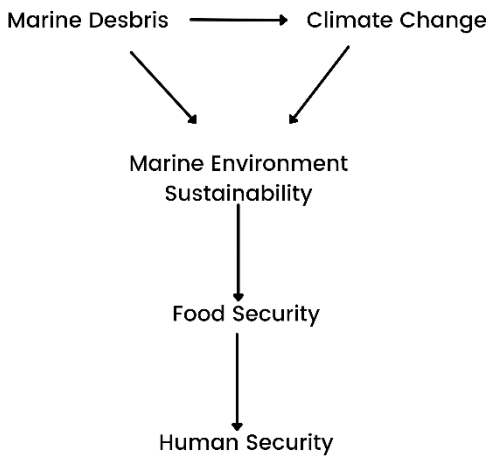

Figure 2. The concept of correlation of variables with each other.
(Compiled by the author)

Based on figure 2, one way to realize human security is by fulfilling food security. Indonesia is a country surrounded by oceans therefore Indonesia's food security can be supported by maintaining marine sustainability. Maintaining the sustainability of the sea is filled with opportunities and challenges.

Marine sustainability can have a positive impact on Indonesia's economic development. The problem of marine debris and climate change is a challenge for Indonesia to realize marine sustainability. In addition, the discovery of fish containing microplastics is evidence that the sustainability of Indonesia's seas is under threat. Along found in fish from the type of Carangidae, mackerel, flying fish, herring fish, rabbitfish, shrimp, bivalves, and shells (Widianarko and Hantoro, 2018). The government and the entire people of Indonesia should mutually synergize to preserve the sea. The government with the function of the planner, executor, trustees, and evaluation can improve the professionalism of its

performance. Society as a form of supreme sovereignty of a country also had a hand in it. The handling of plastic waste needs to be handled with appropriate mechanisms.

Reviving the maritime culture can be a change in people's behavior. The regulation that has been issued will not have a positive impact if not implemented optimally. Then, if it is associated with a program of Sustainable Development Goals (SDGs), food security, conservation of the ocean in a sustainable manner, and climate change greatly affect human security. Therefore, to support the SDGs, Indonesia needs to optimize the role of the sea to achieve the security of the food.

IV. CONCLUSION

The trend of urbanization, globalization, production, and consumption continues to increase resulting in high population trash and a threat to the environment. extensive Indonesia ocean is 2/3 of the mainland. land. The production of marine debris in Indonesia annually is by 3,22 million tons. this waste is not managed properly and is estimated to produce leakage of 0.48-1.29 million metric plastic waste per year into the ocean. Marine debris is dominated by plastic. Plastic waste that is dumped into the surroundings will be trash permanently, both on land and in the water. In fact, plastic waste in the soil will eventually lead to water through such hydrology. Physical processes in the form of fragmentation of mechanical and photolysis make plastic garbage that was originally sized macro into micro-sized (micro-plastics). micro-plastic is very dangerous because it can enter the body of the animals that live in water. Humans will consume micro-plastic if consuming animals that are contaminated with micro-plastics. Therefore, the waste of the ocean very impacts the food security of the sea. This paper finds that the relationship between marine debris to the marine environment has an impact on food security. The state has the responsibility to maintain the security of humans. The government should work together with the community, especially coastal communities to preserve the marine environment. socialization, training, and development of knowledge and skills in the care of the marine environment should be carried out.

REFERENCES

[1] Badan Pusat Statistik. 2014. Kajian Indikator Sustainable Development Goals. Dalam https://www.bps.go.id (Diakses Pada 9 December 2021)

[2] Bouwmeester, H., Peter, C. H. H., Ruud, J. B. P., 2015, Potential Health Impact of Environmentally Released Micro- and Nanoplastics in the Human Food Production Chain: Experiences from Nanotoxicology, Evironment Science Technology Journal.

[3] Carmelite, Maria Alpha. 2019. Konsep Ketahanan Pangan Pada Kasus Overfishing Pada Kawasan Laut Jawa. *Jurnal Dinamik Global*. Volume 4, Nomor 01

[4] Cordova, M. R., Hadi, T. A. and Prayudha, B. 2018. Occurrence and abundance of microplastics in coral reef sediment: a case study in Sekotong, Lombok-Indonesia. AES Bioflux, 10(1). doi: 10.5281/zenodo.1297719.

[5] Cordova, Muhammad Reza et al. 2018. Naskah Akademik Inisiasi Data Sampah Laut Indonesia Untuk Melengkapi Rencana Aksi Nasional Penanganan Sampah Laut Sesuai Peraturan Presiden RI Nomor 83 Tahun 2018. Pusat Artikel Oseanografi-Lembaga Ilmu Pengetahuan Indonesia

[6] Costello, C., L. Cao, S. Gelcich et al. 2019. The Future of Food from the Sea. Washington, DC: World Resources Institute. Available online at www.oceanpanel.org/future-food-sea.

[7] Dahuri, R. 2001. Pengelolaan sumberdaya wilayah pesisir secara terpadu. Penerbit Pradnya Paramita, Jakarta. 189hlm.

[8] Darmono, 2001. Lingkungan hidup dan pencemaran, Indonesia University Press, Jakarta. 141hlm.

[9] Direktorat Jenderal Pengelolaan Ruang Laut. Pencemaran Luat. Dalam kkp.go.id https://kkp.go.id/djprl/bpsplpadang/page/1053-pencemaran-laut (Diakses Pada 9 December 2021)

[10] FAO (United Nations Food and Agriculture Organization). 2018. The State of World Fisheries and Aquaculture: Meeting the Sustainable Development Goals. Rome: FAO.

[11] Huelsenbeck, M. 2012. Ocean-Based Food Security Threatened in a High CO2 World. A Ranking of Nations' Vulnerability to Climate Change and Ocean Acidification. www.oceana.org.

[12] Jambeck et. al. 2015. Plastic waste inputs from land into the ocean, Science, 13 February 2015, VOL 347 Issue 6223.

[13] Manalu, A. A., Hariyadi, S. and Wardiatno, Y. 2017. Microplastics abundance in coastal sediments of Jakarta Bay, Indonesia. AACL Bioflux, 10(5), pp. 1164–1173.

[14] Oceanpanel.org, Transformasi untuk Ekonomi Laut Berkelanjutan Visi untuk Perlindungan, Produktivitas, dan Kesejahteraan, Hig Level Panel for A sustainability Ocean Economy, https://oceanpanel.org/ocean-action/files/transformations-sustainable-ocean-economy-ind.pdf

[15] Pratama, O., 2020, Konservasi Perairan Sebagai Upaya menjaga Potensi Kelautan dan Perikanan Indonesia, Direktorat Jenderal Pengelolaan Ruang Laut, https://kkp.go.id/djprl/artikel/21045-konservasi-perairan-sebagai-upaya-menjaga-potensi-kelautan-dan-perikanan-indonesia.

[16] Pusat Penelitian Oseanografi LIPI. 2019. Naskah Akademik: Inisiasi Data Sampah Laut Indonesia Untuk Melengkapi Rencana Aksi Nasional Penanganan Sampah Laut Sesuai Peraturan Presiden RI No 83 Tahun 2018. Lembaga Ilmu Pengetahuan Indonesia

[17] Putra, A., Husrin, S., 2017, Kualitas Perairan Pasca Cemaran Sampah Laut di Pantai Kuta Bali, Jurnal Jurnal Ilmu dan Teknologi Kelautan Tropis, Vol. 9, No. 1, pp 57-66.

[18] Putra, Aprizon dan Semeide Husrin. 2017. Kualitas Perairan Pasca Pencemaran Sampah Laut di Pantai Kuta Bali. *Jurnal Ilmu dan Teknologi Kelautan Tropis,* Volume 9 (1) 57-65

[19] Syakti, et al, 2017, Beach macro-debris monitoring and floating microplastic in a coastal area of Indonesia, Marine Pollution Bulletin, Vol. 122, pp 220-225.

[20] United Nations Development Program (UNDP). 1994. Human Development Report. Oxford. Oxford University Press.

[21] Utami, Sri Fadhillah. 2019. Bagaimana Plastik Berpengaruh Pada Perubahan Iklim. Dalam zerowaste.id https://zerowaste.id/knowledge/bagaimana-plastik-berpengaruh-pada-perubahan-iklim/ (Diakses Pada 9 December 2021)

[22] Widianarko, Budi dan Inneke Hantoro. 2018. Mikroplastik dalam Seafood dari Pantai Utara Jawa. Semarang: Universitas Katolik Soegijapranata

[23] World Bank. 2018. Hotspot Sampah Laut di Indonesia. Dalam worldbank.org https://documents.worldbank.org (Diakses Pada 9 December 2021)

[24] Yaqin, K., 2020, Mikroplastik ancam Ketahanan Pangan Laut Kita, s publication at: https://www.researchgate.net/publication/343848374